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Consistency and Coordination of Energy Efficiency EM&V and Reporting

January 31, 2017

EM&V Webinars Facilitated By:
Lawrence Berkeley National Laboratory
https://emp.lbl.gov/emv-webinar-series

With Funding From:
U.S. Department of Energy's Office of Electricity Delivery and Energy Reliability-Electricity Policy Technical Assistance Program

In Collaboration With:
U.S. Environmental Protection Agency

National Association of Regulatory Utility Commissioners
National Association of State Energy Officials

Introduction

- LBNL is supported by the U.S. Department of Energy to conduct non-classified research, operated by the University of California

- Provides technical assistance to states—primarily state energy offices and utility regulatory commissions

The presentation was funded by the U.S. Department of Energy's Office of Electricity Delivery and Energy Reliability-National Electricity Delivery Division under Lawrence Berkeley National Laboratory Contract No. DE-AC02-05CH11231.

Technical Assistance

- LBNL provides technical assistance to state utility regulatory commissions, state energy offices, tribes and regional entities in these areas:
  - Energy efficiency (e.g., EM&V, utility programs, behavior-based approaches, cost-effectiveness, program rules, planning, cost recovery, financing)
  - Renewable energy resources
  - Smart grid and grid modernization
  - Utility regulation and business models (e.g., financial impacts)
  - Transmission and reliability
  - Resource planning
  - Fossil fuel generation
- Assistance is independent and unbiased
- LBNL Tech Assistance website: https://emp.lbl.gov/projects/technical-assistance-states
- US DOE Tech Assistance gateway: http://energy.gov/ta/state-local-and-tribal-technical-assistance-gateway

Webinar Series

- Webinars designed to support EM&V activities for documenting energy savings and other impacts of energy efficiency programs
- Funded by U.S. DOE in coordination with EPA, NARUC and NASEO
- Outreach partners include: ACEEE, IEPEC and Regional Energy Efficiency Organizations such as NEEP, MEEA and SEEA
- Audience:
  - Utility commissions, state energy offices, state environment departments, and non-profits involved in operating EE portfolios
  - Particular value for state officials starting or expanding their EM&V
  - Evaluation consultants, utilities, consumer organizations and other stakeholders also are welcome to participate
- For more information (upcoming and recorded webinars, EM&V resources) see:
  - https://emp.lbl.gov/emv-webinar-series
  - General Contact: EMVwebinars@lbl.gov

Series Contact:
Steve Schiller
Senior Advisor, LBNL
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Next Webinar

- More webinars coming for 2017 and beyond…

Today's Webinar – Coordination/Consistency

- EM&V processes and reporting practices vary among utilities and other efficiency program administrators and states
- Consistency, rigor and completeness concerns have been identified
- There are opportunities via increasing coordination on EM&V and consistency of reporting for:
  - Improving the quality of EM&V
  - Facilitating benchmarking, disclosure, tracking and reporting of energy efficiency impacts
  - Reducing EM&V development and implementation costs

Today's Agenda

- *Western states EM&V coordination project* with reporting tool examples – Steve Schiller, Berkeley Lab
- *DOE's Uniform Methods Project* - Michael Li, U.S. Department of Energy
- *National Energy Efficiency Registry* - Molly Cripps, Tennessee Office of Energy Programs, and Rodney Sobin, NASEO
- *M&V for industrial efficiency* - Peter Therkelsen, Berkeley Lab
- *LBNL database and tracking efforts for ESCO projects -* Liz Stuart, Berkeley Lab
- Q&A with panelists

Western EM&V Coordination Options Project

Technical Assistance by:
Electricity Markets and Policy Group
Lawrence Berkeley National Laboratory (LBNL)

For:
Western Interstate Energy Board (WIEB)

Funded By:
U.S. Department of Energy

Presentation by Steve Schiller, LBNL

Background

- In 2015, WIEB requested technical assistance on exploring potential multi-state coordination on DSM EM&V.
- LBNL prepared a brief titled "*Coordinating Demand-Side Efficiency Evaluation, Measurement and Verification Among Western States: Options for Documenting Energy and Non-Energy Impacts for the Power Sector*." The brief can be found at: https://emp.lbl.gov/sites/all/files/lbnl-1005776_0.pdf.
- The brief covered three potential approaches and several possible products for EM&V coordination among state and regional agencies addressing:
  - *Energy efficiency, demand response and other distributed resources, and*
  - *Pollution prevention.*
- Subsequently, there is interest in developing a Western States EM&V Clearinghouse – now being explored by WIEB and LBNL with input from Western states and regional organizations.

What is EM&V Coordination?

- Fundamentally, EM&V coordination for *energy efficiency and demand response* programs and measures consists of *effective interactions* among public agencies and other organizations *concerning the documentation of the potential and actual impacts* of these activities.

- Coordination can also include *distributed generation and storage.*

- Public agencies that might be involved in such coordination are:
  - State PUCs, energy offices and air regulators
  - Local agencies such as city and regional governments with their own efficiency initiatives and community development offices
  - Regional organizations (e.g., independent system operators, Northwest Power & Conservation Council Regional Technical Forum)

National Examples

- **The State and Local Energy Efficiency Action Network (SEE Action) -** https://www4.eere.energy.gov/seeaction/
  - Offers resources, discussion forums, and technical assistance to state and local entities
  - Facilitated by US DOE and US EPA
  - Has an EM&V Working Group

Covered in Todays Webinar

U.S. DOE's Uniform Methods Project - http://energy.gov/eere/about-us/about-ump

- Developing M&V protocols for determining energy savings for commonly implemented program measures.
- Collaborating with energy efficiency program administrators, and stakeholders
- Has national technical and steering committees

NEER - https://www.theclimateregistry.org/thoughtleadership/energy-efficiency/

- Six U.S. states, The Climate Registry and NASEO secured a DOE award to develop a national energy efficiency registry (NEER).
- Registry would be intended to allow states to track their own initiatives as well as demonstrate progress towards energy goals

Why EM&V Coordination?

- EM&V coordination among (Western) states' public agencies could:
  - Facilitate and improve the quality of EM&V
  - Facilitate interstate (and intrastate) benchmarking, disclosure, and tracking of demand side projects and their energy savings by improving the consistency and quality of EM&V procedures
  - Support trading of energy efficiency and DER savings credits if used for pollution reduction programs or regulations
  - Reduce EM&V development and implementation costs, thus reducing the cost of DSM program implementation and encouraging more energy savings
- However there can be some challenges to coordination:
  - Potential for some loss of local or state control
  - "Lowest common denominator" - products or services that do not meet the needs of some of the participating entities
  - Increased costs and delays through coordination inefficiencies or failures

Identified Coordination Options

- **Information clearinghouse/exchange** – a relatively low level of coordination involving sharing of existing EM&V documents, procedural approaches and exchanging information and experience

- **EM&V product development** – mutual (voluntary) development of specific EM&V products that support consistent, cost-effective EM&V implementation

- **Regional EE and DR tracking system platform** – development and implementation by interested states of a regional entity that administers registry rules and reporting infrastructure. The tracking system could support:
  - Compliance with state, regional or federal pollution prevention programs
  - Disclosure and benchmarking of regional, state and/or local EE and DR efforts

Clearinghouse Option Being Pursued

- Based on feedback and comments from Western States

  Fall 2016 Webinar on coordination and clearinghouse: http://westernenergyboard.org/wieb-board/projects/idaho-wieb-state-energy-planning/meetings-and-webinars/

- Benefits as mentioned in prior slides. However, the prior mentioned challenges are not significant at this level of coordination.

- Clearinghouse can be springboard to higher levels of coordination

EM&V Clearinghouse: Options for Moving Forward

Information that could be shared:

- EM&V methodologies and deemed savings values/calculations
- State evaluation framework documents and protocols
- Technical papers describing EM&V issues and techniques
- Examples of requests for proposals used to solicit independent evaluators
- Links to regulatory filings and orders on energy efficiency EM&V
- Contact information for people conducting EM&V activities
- Glossary of EM&V terms
- Case studies and lessons learned from EM&V activities

Possible Formats

- Web site with public and password-protected information
- Regular webinars, workshops or conferences
- Informal information-sharing and networking among those involved in EM&V via listservs, “Meet-ups,” conference calls, etc.
- Technical assistance network that shares experts available to support agencies

For more information on Western EM&V Coordination

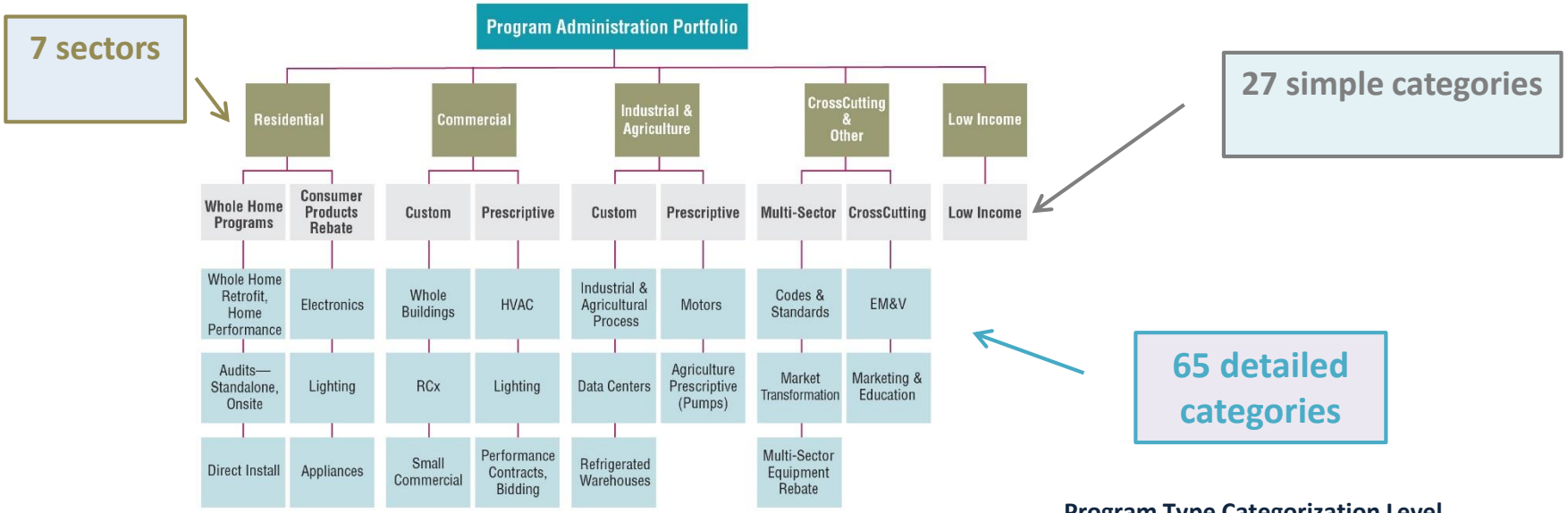
- Fall 2016 Webinar on coordination and clearinghouse: http://westernenergyboard.org/wieb-board/projects/idaho-wieb-state-energy-planning/meetings-and-webinars/
- LBNL brief titled "Coordinating Demand-Side Efficiency Evaluation, Measurement and Verification Among Western States: Options for Documenting Energy and Non-Energy Impacts for the Power Sector." https://emp.lbl.gov/sites/all/files/lbnl-1005776_0.pdf
- Contact:
  - Alaine Ginocchio, Attorney/Policy Analyst, Western Interstate Energy Board, aginocchio@westernenergyboard.org
  - Steve Schiller, Senior Advisor/Affiliate, Berkeley Lab, srschiller@lbl.gov
  - Lisa Schwartz, Deputy Group leader, Electricity Markets and Policy Group, LCSchwartz@lbl.gov

Example Opportunity for Increasing Consistency: Energy Efficiency Program Reporting

- Administrators of utility customer-funded energy efficiency programs regularly report what they spend and save to their regulators or other oversight entities
- These reports typically include:
  - Narrative that highlights achievements of the program administrator's portfolio of efficiency programs
  - Tables and charts that quantify spending, savings, and achievement of policy objectives
- Issues:
  - Energy efficiency reporting practices vary widely among program administrators and states.
  - Many studies of reporting practices for efficiency programs have identified issues of consistency, rigor and completeness
  - Challenging to determine whether a program administrator is achieving its energy efficiency goals

Issue in EE Reporting – Standardized Program Typology

- Weak consensus on EE terminology and no fully adopted standard scheme for characterizing EE programs

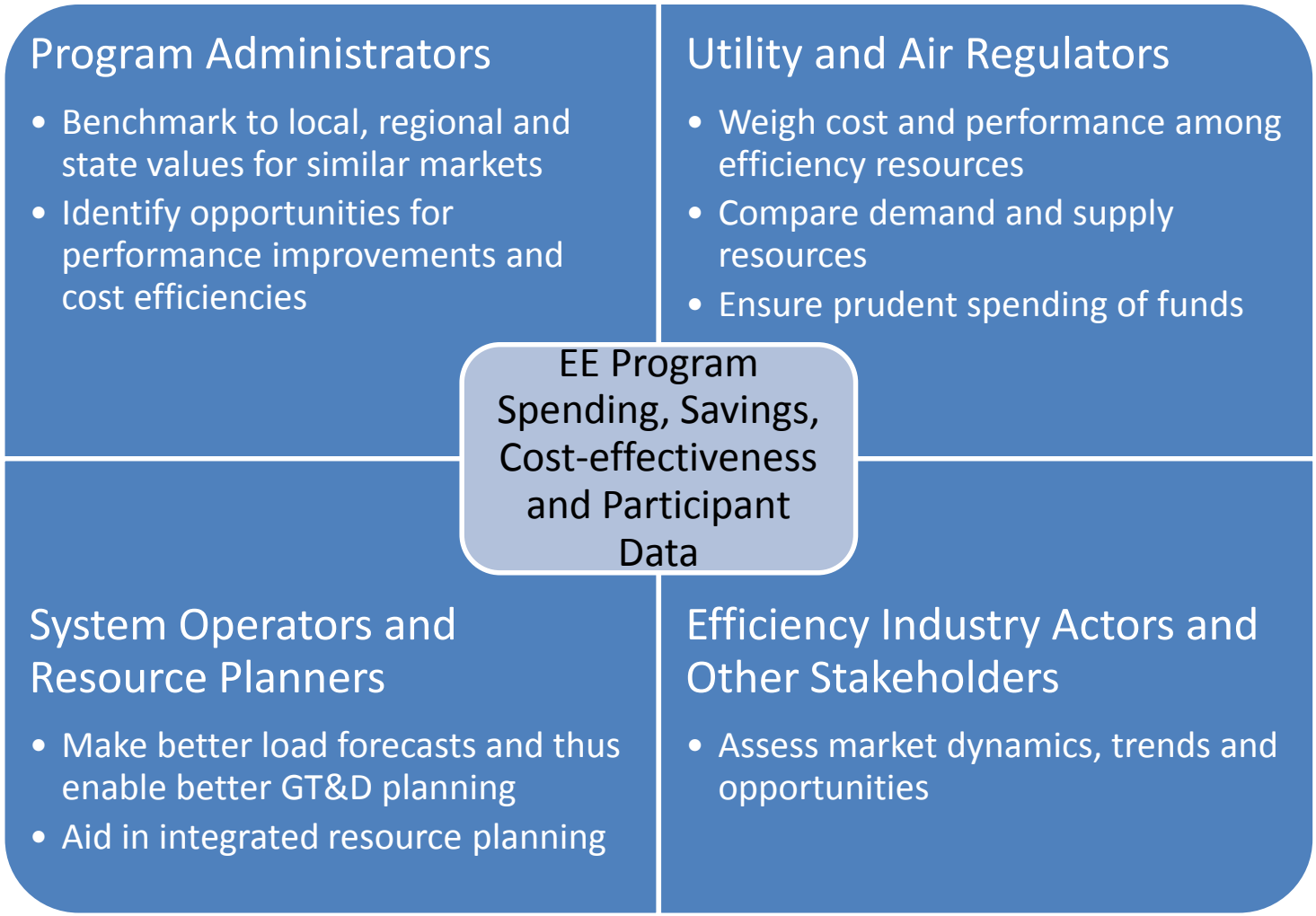


See LBNL Policy Brief: Energy Efficiency Program Typology and Data Metrics: Enabling Multi-State Analyses Through the Use of Common Terminology – at http://emp.lbl.gov

EE Reporting Project Objectives

- Encourage more transparency, consistency and rigor in reporting EE program impacts, costs and methodologies
  - Particularly in those states where program administrators do not currently provide annual reports
  - Elevate the quality of reporting by states that are new to EE or just ramping up
  - Greater consistency: classification of spending and resource costs (administrative costs, incentives) and estimation of program impacts (e.g., net savings)
- Encourage comprehensiveness
  - More program-level reporting by states and program administrators on total costs, cost effectiveness, customer participation, market penetration

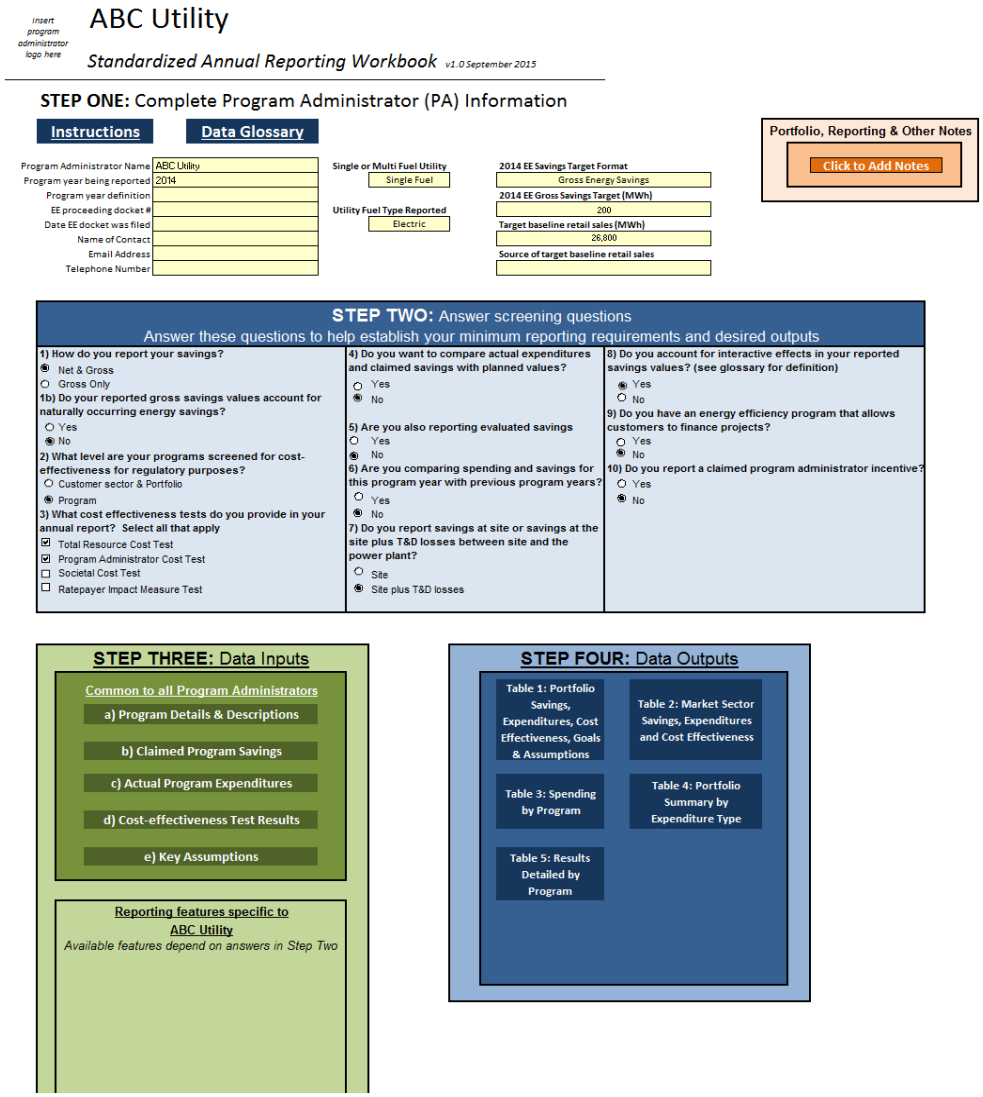
Uses of Reported Energy Efficiency Data



LBNL Energy Efficiency Reporting Tools

For Mid-Sized/Early Stage Private Utilities Or Other Similar Program Administrators

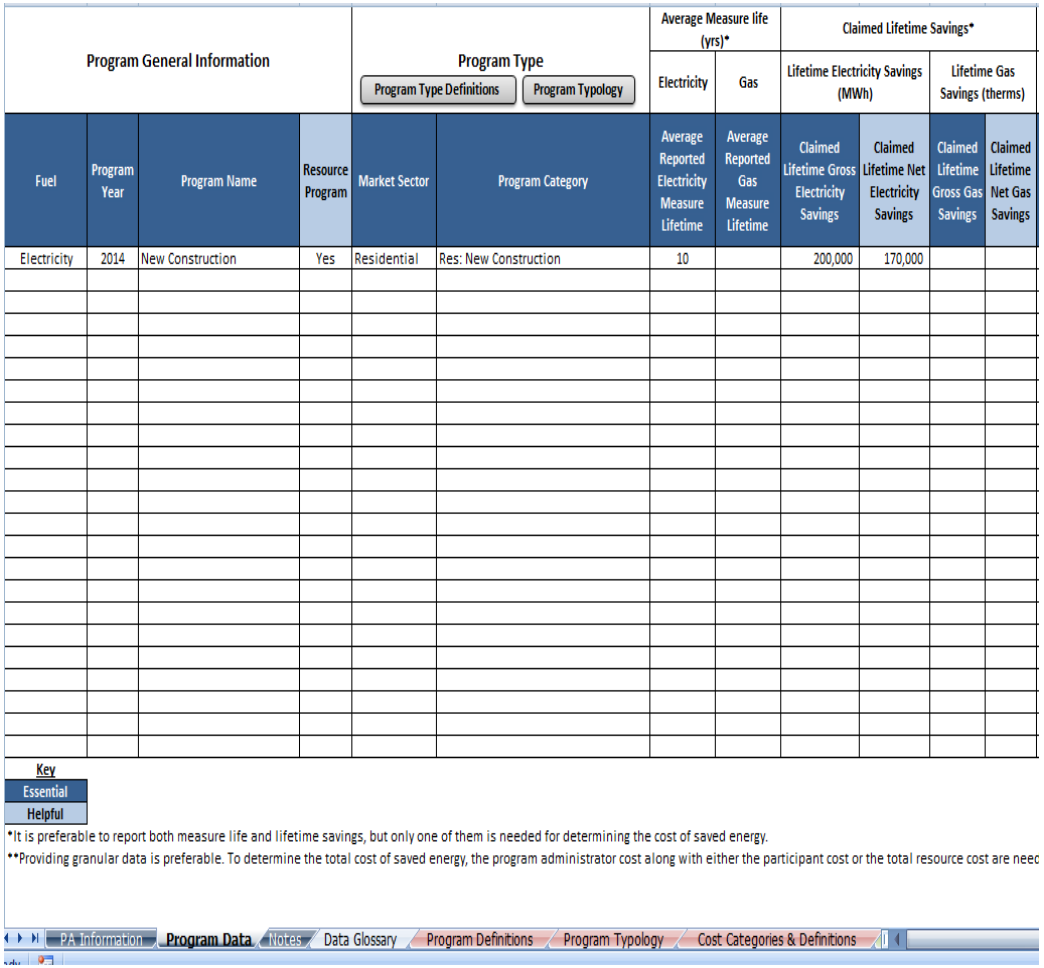
- Full-featured DSM reporting tool for program administrators (PA) funded by utility customers
  - Flexible to accommodate the diverse data requirements in states while maintaining consistency
  - Program-level data on spending, savings, participation, cost effectiveness and program design
  - Screening questions allow PA or PUC to customize information that is to be reported
  - Includes data glossary and program typology



LBNL Energy Efficiency Reporting Tools

FOR SMALL/EARLY STAGE PUBLIC POWER PROGRAM ADMINISTRATORS

- Working with APPA
- Simpler DSM reporting template developed for public power utilities
  - Objective: Consistency with low reporting burden for small staffs
  - Program-level data on spending, savings, participation, cost effectiveness and program design
  - Essential and supplemental (optional) data fields
  - Includes data glossary and program typology



Program General Information				Program Type (Program Type Definitions / Program Typology)		Average Measure life (yrs)*		Claimed Lifetime Savings*			
						Electricity	Gas	Lifetime Electricity Savings (MWh)		Lifetime Gas Savings (therms)	
Fuel	Program Year	Program Name	Resource Program	Market Sector	Program Category	Average Reported Electricity Measure Lifetime	Average Reported Gas Measure Lifetime	Claimed Lifetime Gross Electricity Savings	Claimed Lifetime Net Electricity Savings	Claimed Lifetime Gross Gas Savings	Claimed Lifetime Net Gas Savings
Electricity	2014	New Construction	Yes	Residential	Res: New Construction	10		200,000	170,000		

Key
Essential
Helpful

*It is preferable to report both measure life and lifetime savings, but only one of them is needed for determining the cost of saved energy.
**Providing granular data is preferable. To determine the total cost of saved energy, the program administrator cost along with either the participant cost or the total resource cost are neec

PA Information | Program Data | Notes | Data Glossary | Program Definitions | Program Typology | Cost Categories & Definitions

For More Information on Reporting Tools

- See LBNL website for 'cost of saved energy' with information on the reporting tools:
  - Available at no cost for download with supporting reports and documents
  - https://emp.lbl.gov/what-it-costs-save-energy

- Contact:

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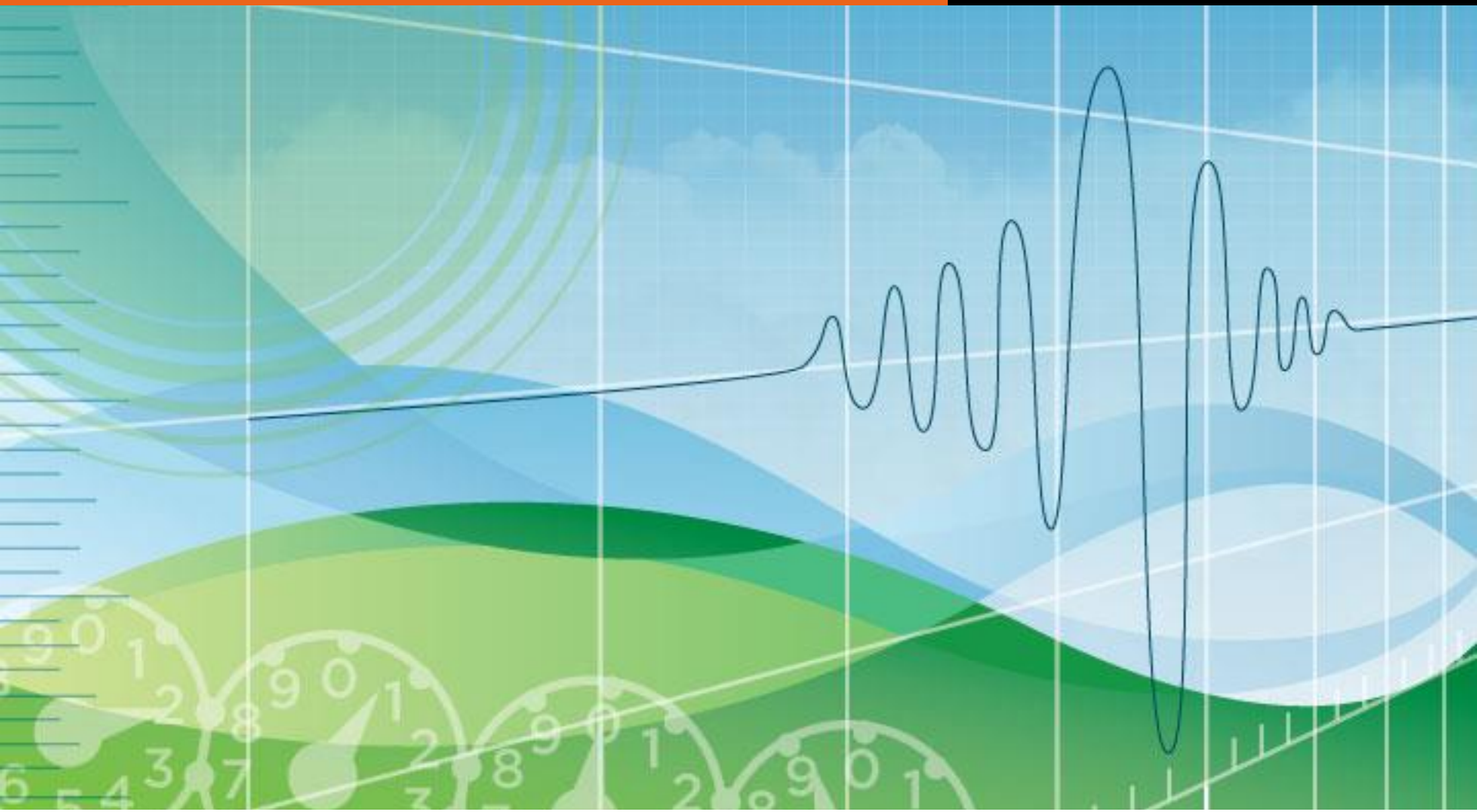
Now - Our Other Topics and Speakers

- *DOE's Uniform Methods Project –*
  - Michael Li, U.S. Department of Energy
- *National Energy Efficiency Registry –*
  - Molly Cripps, Tennessee Office of Energy Programs
  - Rodney Sobin, NASEO
- *M&V for industrial efficiency –*
  - Peter Therkelsen, Berkeley Lab
- *LBNL database and tracking efforts for ESCO projects and utility programs –*
  - Liz Stuart, Berkeley Lab

Uniform Methods Project



Michael Li, Office of Energy Efficiency and Renewable Energy

Introduction to UMP

- The goal is to strengthen the credibility of energy efficiency programs by improving the consistency and transparency of how energy savings are determined.
- UMP is a set of protocols for determining savings from energy efficiency measures and programs.
- UMP documents the generally accepted best practice method for determining savings for each protocol.

Key Elements

- More detailed approach based on IPMVP in most cases
- Protocols for individual measures focus on gross savings primarily
- Application is for EE programs, not projects.
- For project M&V, DOE has developed the FEMP M&V Guidelines used primarily for ESPC projects

Protocol Contents

- A description of measure and application conditions
- An algorithm for estimating savings
- An example of a typical program offering and alternative delivery strategies
- Considerations for the measurement and verification process, including an International Performance Verification and Measurement Protocol (IPMVP) option
- Data requirements for verification and recommended data collection methods
- Recommended program evaluation elements

Commercial Measures

- Commercial and Industrial Lighting Evaluation Protocol (April 2013)
- Commercial and Industrial Lighting Controls Evaluation Protocol (April 2013)
- Chiller Evaluation Protocol (September 2014)
- Commercial New Construction Protocol (September 2014)
- Retrocommissioning Evaluation Protocol (September 2014)
- Variable Frequency Drive Evaluation Protocol (September 2014)
- HVAC Controls (DDC/EMS/BAS) Evaluation Protocol (September 2014)
- Data Center IT Efficiency Measures (January 2015)
- Compressed Air Evaluation Protocol (November 2014)
- Combined Heat and Power Evaluation Protocol (November 2016)

Residential & Commercial Protocols

- **Residential Furnaces and Boilers Evaluation Protocol (April 2013)**
- **Residential Lighting Evaluation Protocol (December 2014)**
- **Residential Behavior Protocol (January 2015)**
- **Refrigerator Recycling Evaluation Protocol (April 2013)**
- **Small Commercial and Residential Unitary and Split System HVAC Cooling Equipment-Efficiency Upgrade Evaluation Protocol (April 2013)**
- **Whole-Building Retrofit with Consumption Data Analysis Evaluation Protocol (April 2013)**

Cross-Cutting Protocols

- **Metering Cross-Cutting Protocols (April 2013)**
- **Peak Demand and Time-Differentiated Energy Savings Cross-Cutting Protocols (April 2013)**
- **Sample Design Cross-Cutting Protocols (April 2013)**
- **Survey Design and Implementation Cross-Cutting Protocols for Estimating Gross Savings (April 2013)**
- **Assessing Persistence and Other Evaluation Issues Cross-Cutting Protocols (April 2013)**
- **Estimating Net Savings: Common Practices (September 2014)**

Each chapter has been written by technical experts in collaboration with their peers, reviewed by industry experts, and subject to public review and comment.

Protocols are updated as necessary. Major and minor revisions to most of the protocols will occur in 2017.

Protocol Development Process

Authors and Contributors

- Funded by the U.S. Department of Energy
- Managed by the National Renewable Energy Lab
- Cadmus is the principal consultant
- Protocol authors are the experts as identified by their peers

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- Building Metrics Inc.
- Northwest Power Planning Council
- Northeast Energy Efficiency Partnerships
- Ridge & Associates
- Ralph Prahl & Assoc.
- NMR
- TechMarket Works
- CDH Energy Corp.
- PECI

M&V Studies

- **Ameren Illinois Appliance Recycling Evaluation 2014**
  - Refrigerator Recycling Evaluation Protocol
- **PacifiCorp HES Evaluation 2014**
  - Residential Lighting Evaluation Protocol
- **EmPOWER Maryland 2014**
  - Sample Design Cross-Cutting Protocol
- **Vectren Indiana 2015**
  - Gas DSM Portfolio Evaluation (Residential Furnaces and Boilers Evaluation Protocol)
  - 2015 Process and Impact Evaluation

Use of UMP

Request for Proposals

- **Salt River Project – 2016**
- **Puget Sound Energy - 2016**
- **Duke Energy – 2015**
- **Energize Connecticut – 2015**
- **Iowa Statewide TRM - 2014**

Technical Reference Manuals

- **2015 Pennsylvania Technical Reference Manual**
- **2015 Illinois Statewide Technical Reference Manual Version 4.0**
- **2015 Iowa Technical Reference Manual**

For Further Information

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Uniform Methods Project
https://energy.gov/eere/about-us/ump-home

SEE Action
www.seeaction.energy.gov

The Climate Registry

NEER

NATIONAL ENERGY EFFICIENCY REGISTRY

Molly Cripps

Rodney Sobin

The Climate Registry

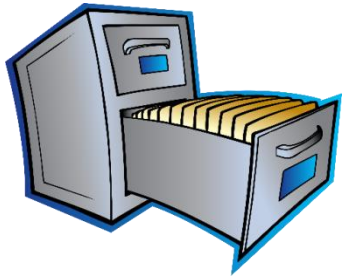
About the NEER

- A central repository that will allow the public and private sectors to transparently track attributes associated with energy efficiency initiatives
- Policy neutral
- Built on best practice
  - Registry design
  - EE accounting and reporting protocols
- Will help states demonstrate progress towards energy goals and potential compliance with existing and future regulation
- Will be able to track energy conservation and other types of reduction efforts

NEER = Tool (Not a Policy)

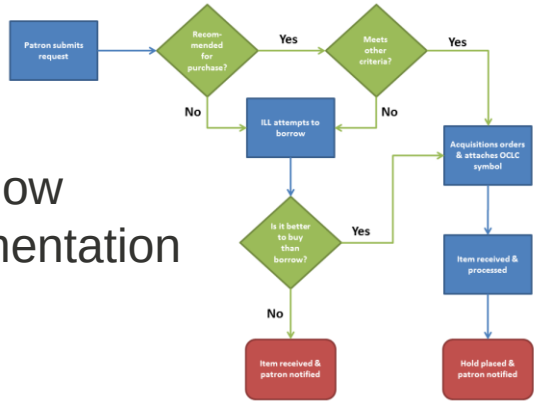
➔ **NEER will be a software platform**

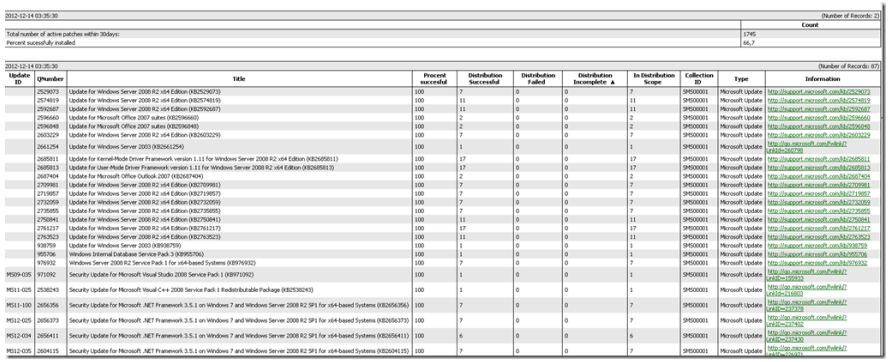
Document management



Transaction accounting

Workflow documentation





Compliance Reporting

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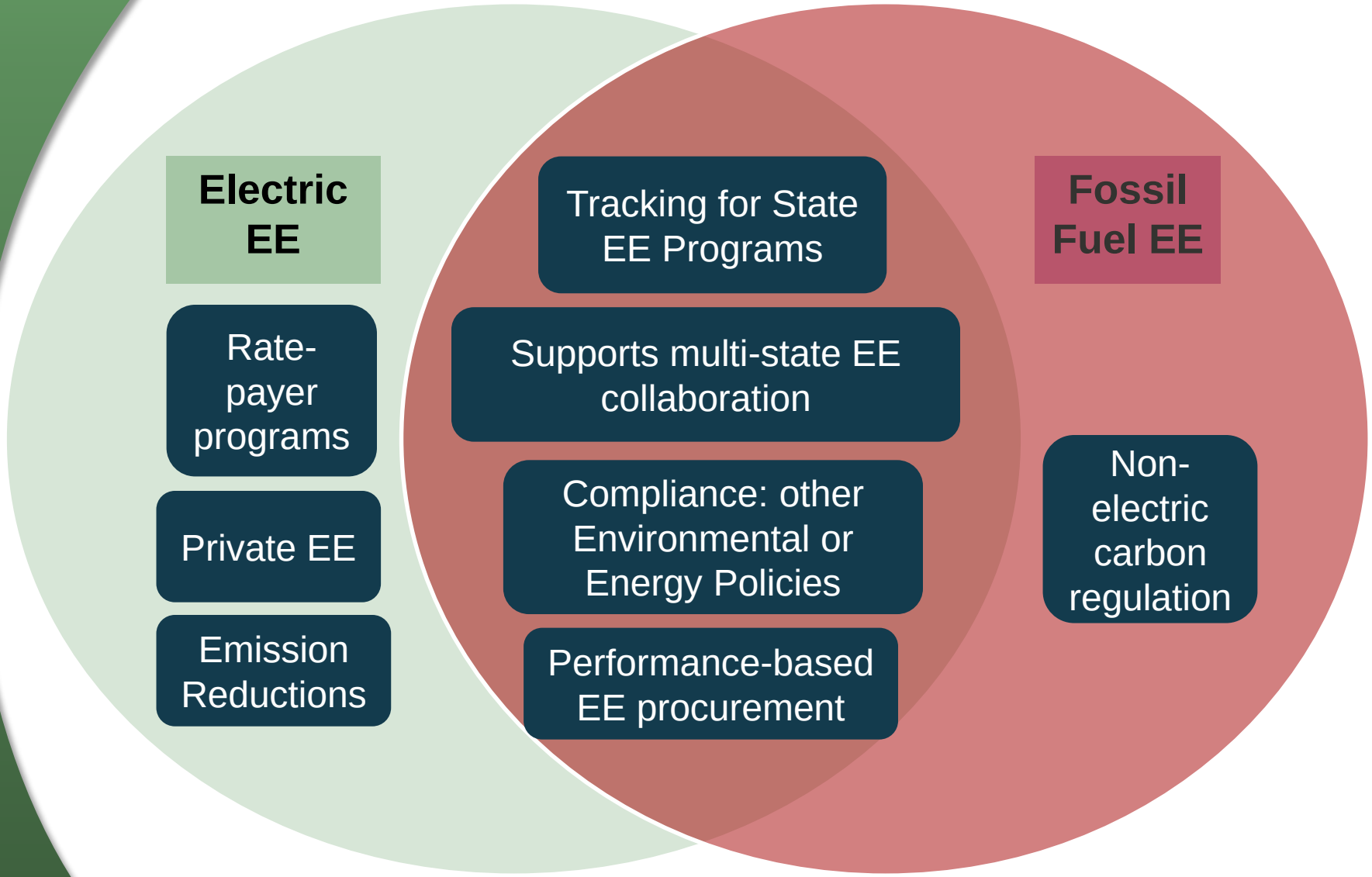
Potential NEER Applications



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NEER Objectives

- ➔ Provide a consistent framework that better recognizes EE contributions for achieving energy and environmental objectives
- ➔ Document verification of EE projects according to the appropriate eligibility standards
- ➔ Facilitate the opportunity for EE instrument trading

Improve transparency and credibility of EE as (often) the lowest cost energy resource.

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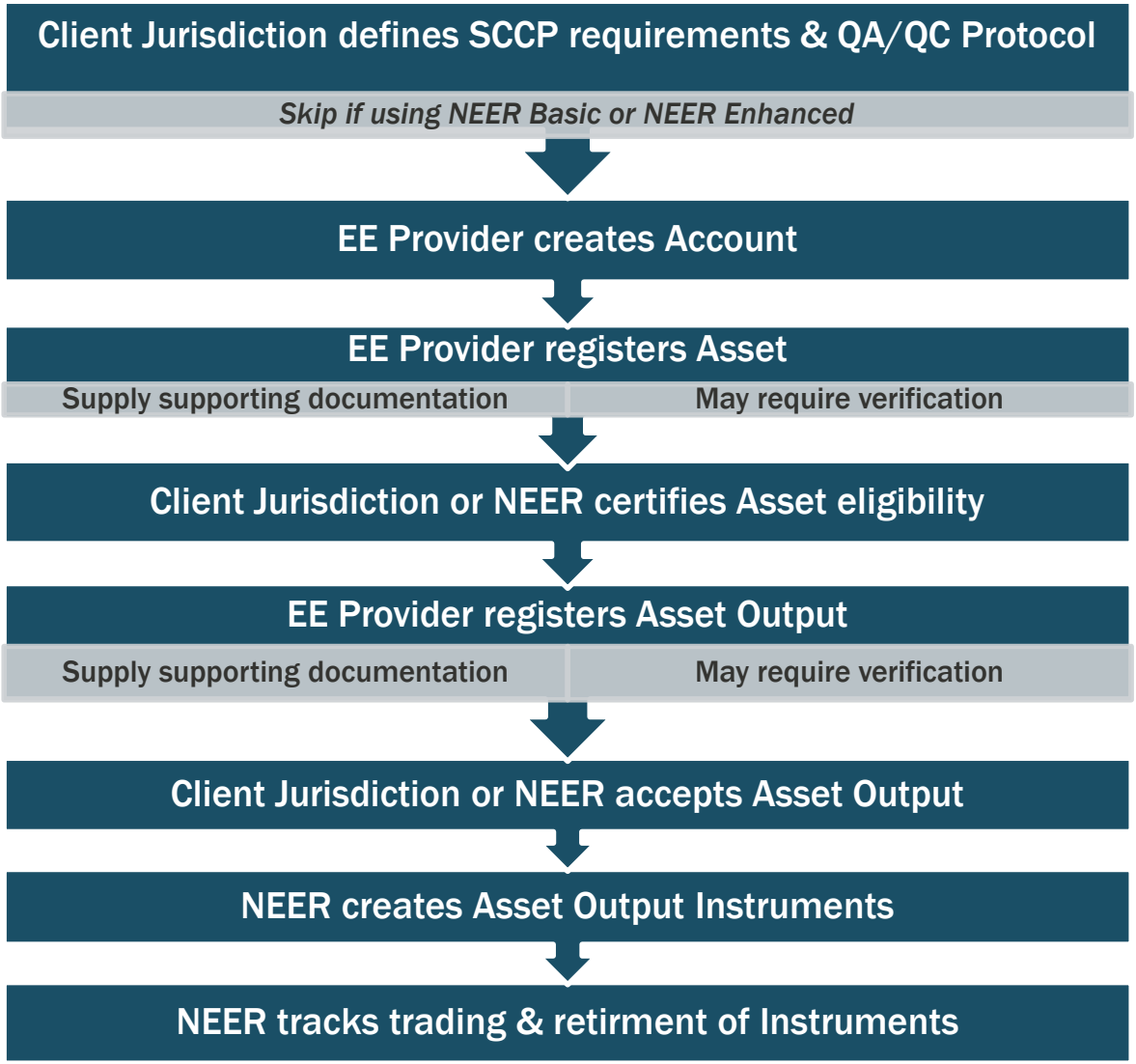
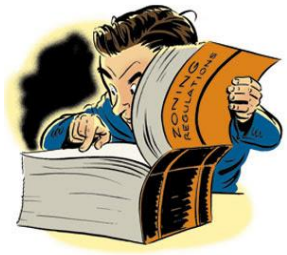
IMPROVING EM&V DISCLOSURE

The Climate Registry

NEER Steps:

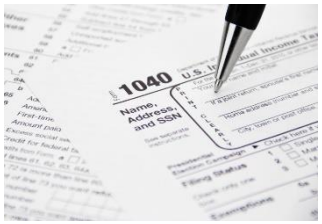


Example: Reporting Asset Output

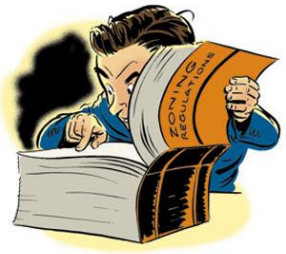


Regulator creates forms

Applicant gathers data



Applicant fills in forms

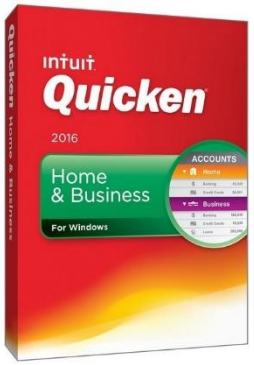


Regulator makes a determination

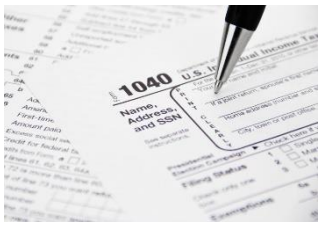
Example: Reporting Asset Output

IRS customizes the forms

Tax payer gathers data



Data management
Process control
Doing the Math



Tax Payer completes and submits forms

Independent Professional Certifies work

IRS Make determination

The Climate Registry

NEER Support of State Efforts

- Can lower EE program, policy administrative costs by:
  - Streamlined, consistent, (sometimes) automated processes
- Streamline energy efficiency project EM&V
- Support state energy and environmental planning efforts
- Avoid double counting of energy savings
- Create greater transparency of energy efficiency programs and impacts

The Climate Registry

NEER Support of State Efforts

- ***NEER can improve the credibility and transparency of energy savings and associated benefits.***
- ***This would increase recognition of EE as cost-effective and efficacious for helping meet state energy and environmental goals.***
- ***This can incite more investment in EE.***

The Climate Registry

WHERE WE ARE NOW

The Climate Registry

NEER Project Team

➔ State project partners:

TN Department of Environment & Conservation

MI Energy
Michigan Agency for Energy
Michigan Energy Office

Minnesota Department of Commerce

GEFA
Energy • Land • Water

Oregon Department of Energy

pennsylvania
Department of Environmental Protection

NEER Project Team

➔ Supporting project partners:

The Climate Registry

National Association of State Energy Officials

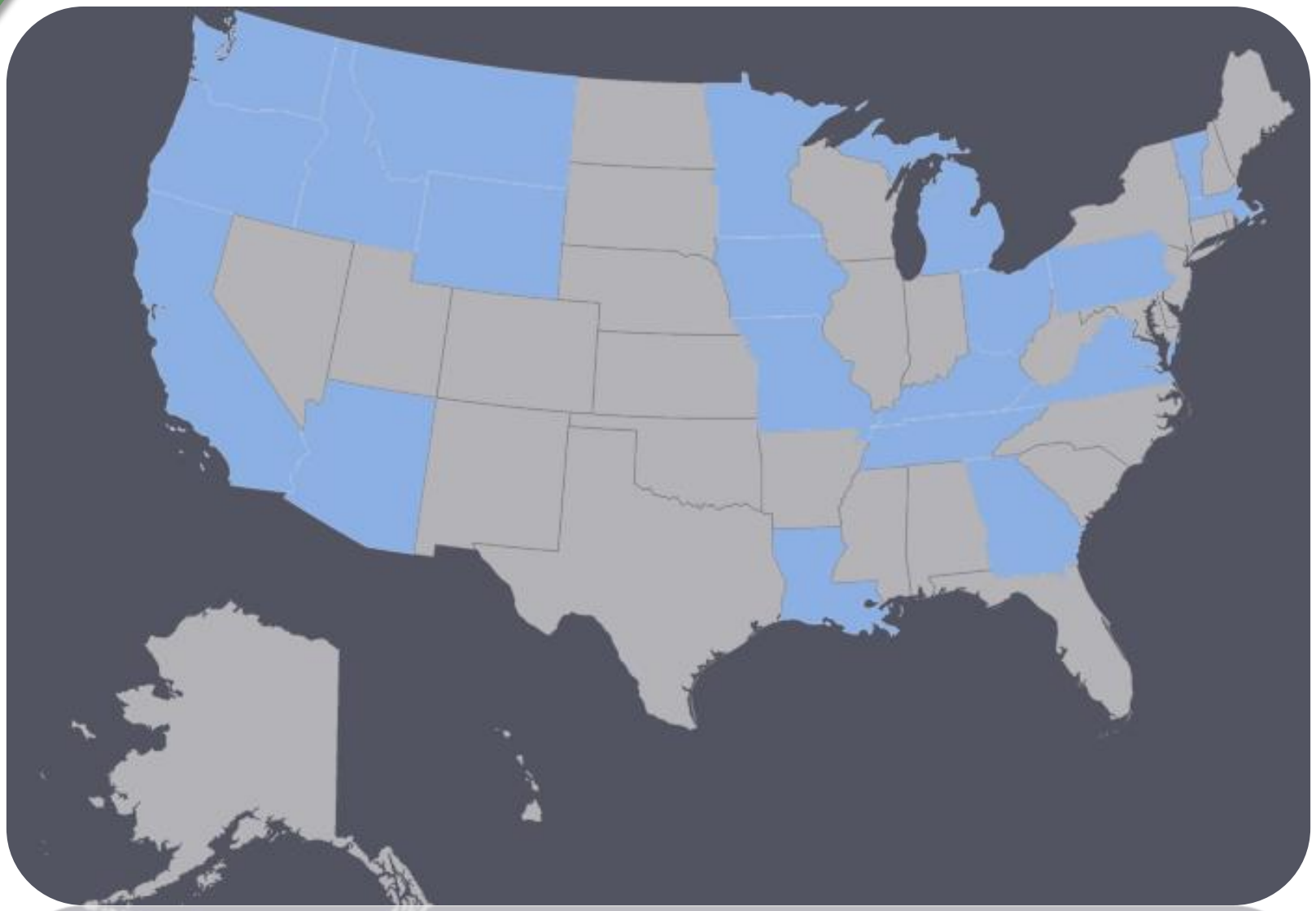
➔ Additional project support provided by:

E4 THE FUTURE

APX Energy. Environment. Market Integrity.

The Climate Registry

NEER Stakeholder States



The Climate Registry

How to get Involved

- Help design user scenarios relevant to your state programs
- Provide feedback on draft Principles and Operating Rules (April–May 2017)

For More Information Please Contact: Ryan Cassutt at:
rcassutt@theclimateregistry.org

The Climate Registry

Thank you!

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U.S. DEPARTMENT OF ENERGY

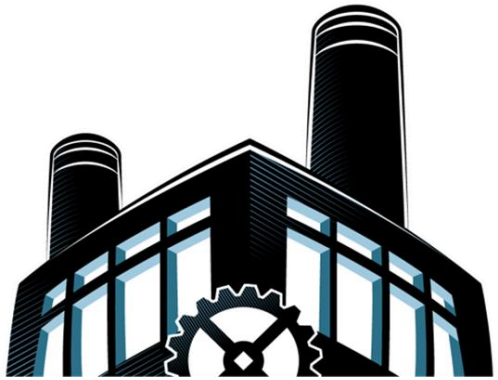
M&V for Industrial Efficiency

Dr. Peter Therkelsen
Lawrence Berkeley National Laboratory

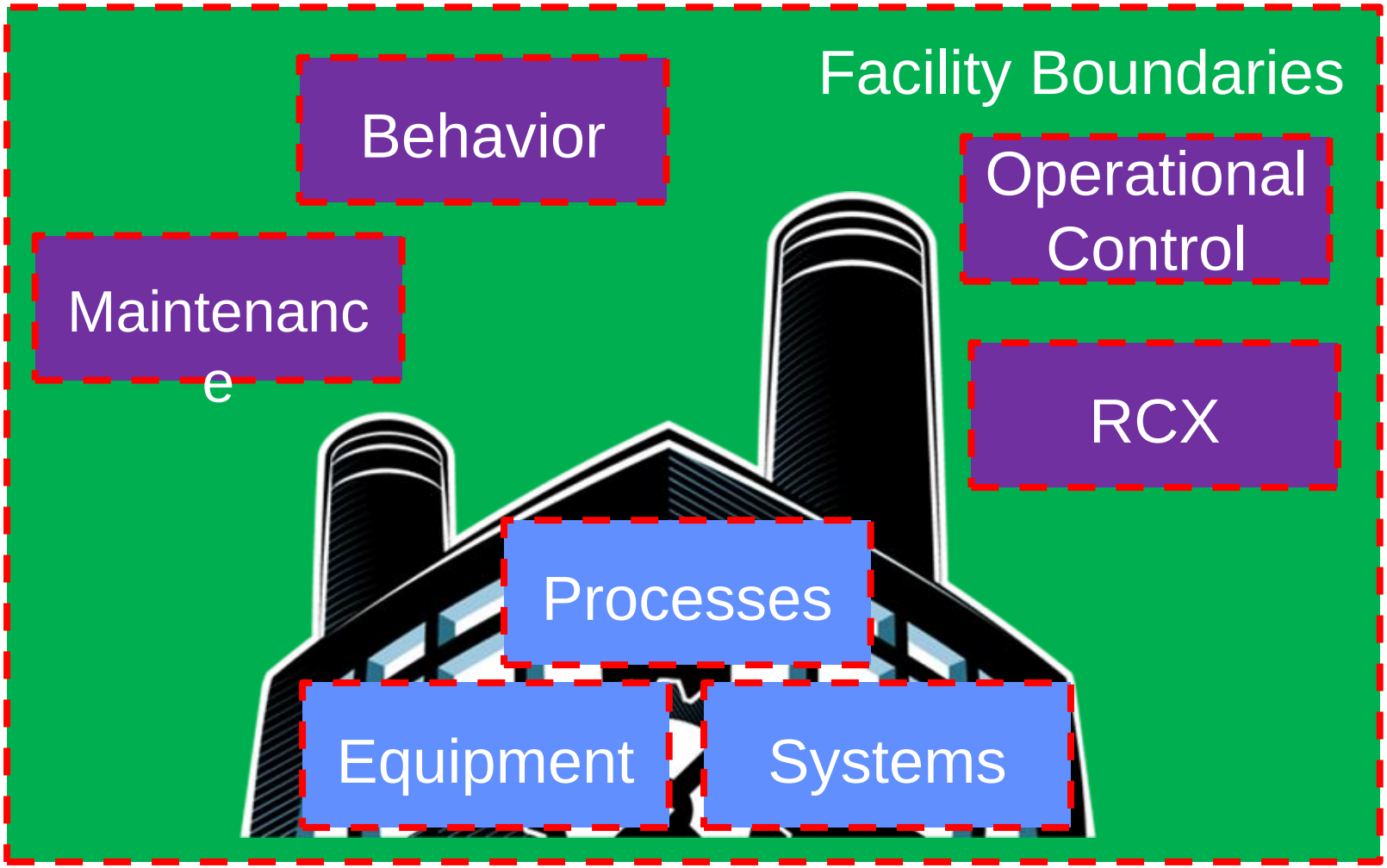
January 31, 2017

Agenda

- Energy efficiency opportunities in industry
- Common approaches to achieving energy savings in industry
- Energy Management Systems and Strategic Energy Management (SEM) – facility-wide approach
- Facility-wide M&V
- Standards and harmonization of facility-wide M&V
- US DOE “50001 Ready”



Technology and operations offer energy savings potential in industry



Most utility industrial programs do not include operational improvements

Project Level

Equipment
Systems
Processes

Deemed

Custom

Facility Boundaries Level

Behavior
Maintenance
Operational
Control
RCX

Equipment
Systems
Processes

Energy management systems (EnMS) based strategic energy management (SEM) programs drive operational and technology energy savings in industry

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Energy Management System (EnMS)

- **Business practice to actively manage and continually improve energy performance facility wide**
  - **—Sector agnostic but most common in industry**
- **ISO 50001 - International EnMS standard**
  - **—Requirements for best practice EnMS**

Growing number of utility and other programs aimed at improving energy performance facility wide

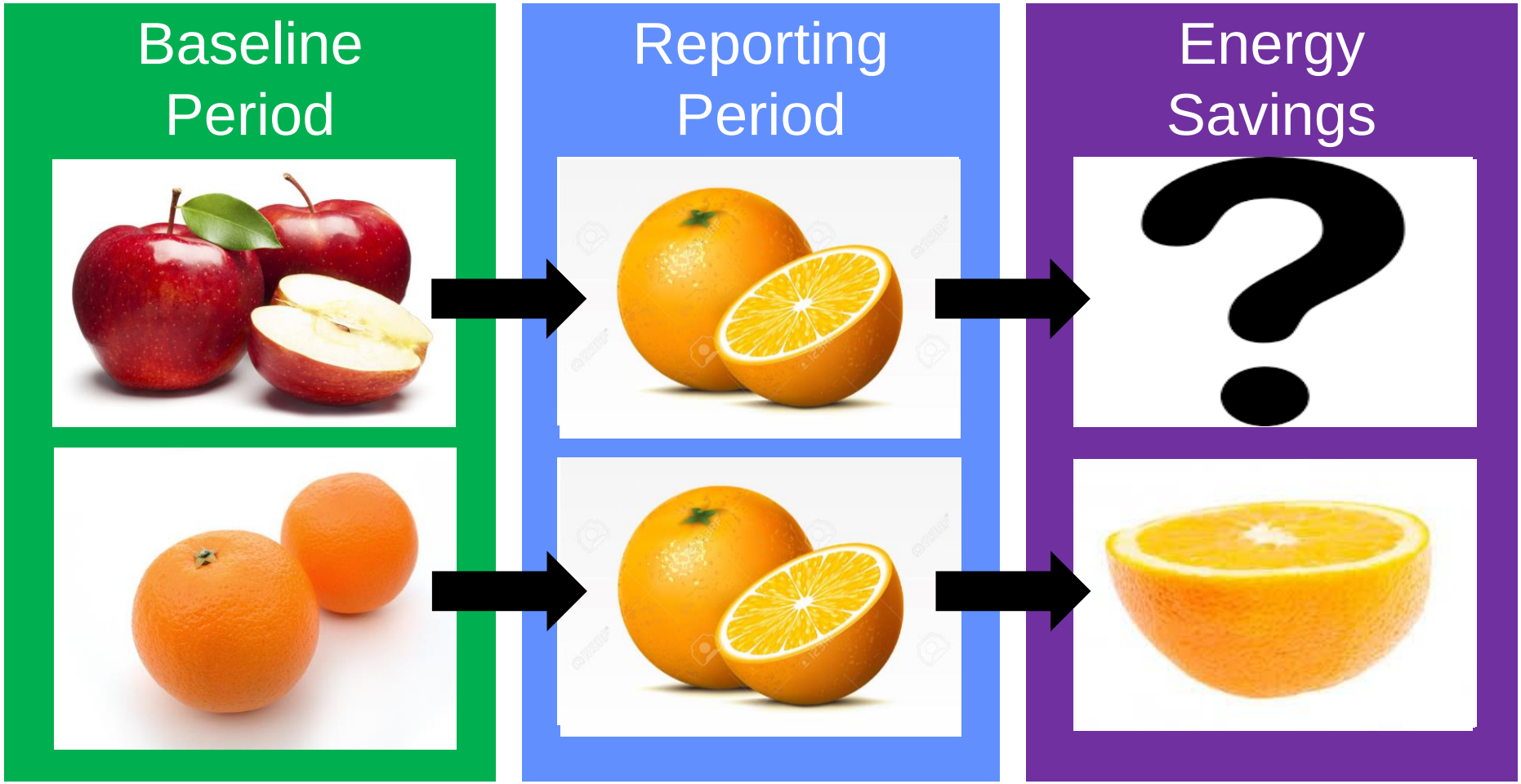
- **Utility based program commonly referred to as "Strategic Energy Management" (SEM) programs**
  - **—BPA, Energy Trust of Oregon, BC Hydro, Wisconsin FOE, Eversource…**

SEM programs determine facility wide energy savings as the difference in baseline and reporting period energy consumption

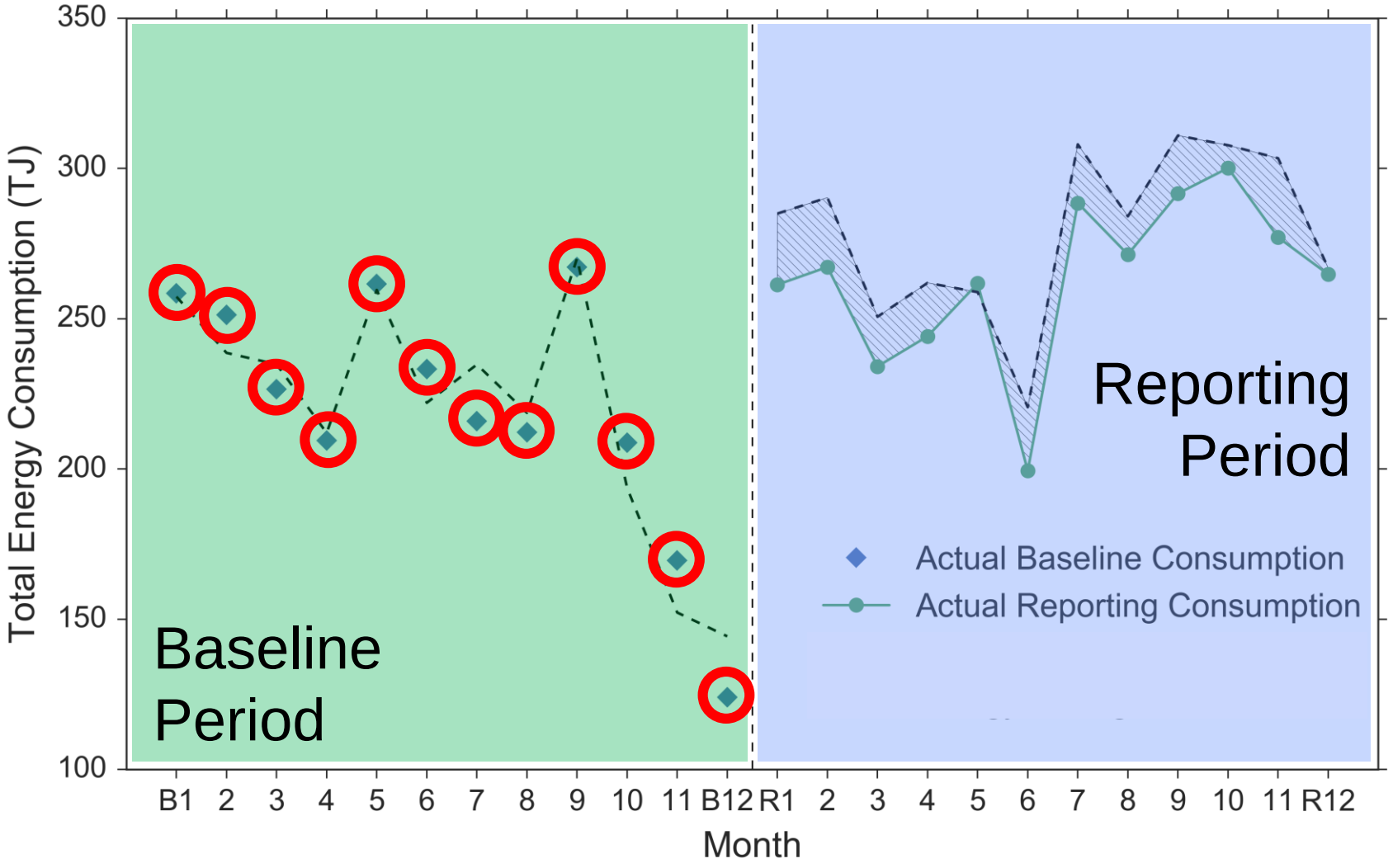
Relevant variables affect energy consumption levels

- **Production**
- **Weather**

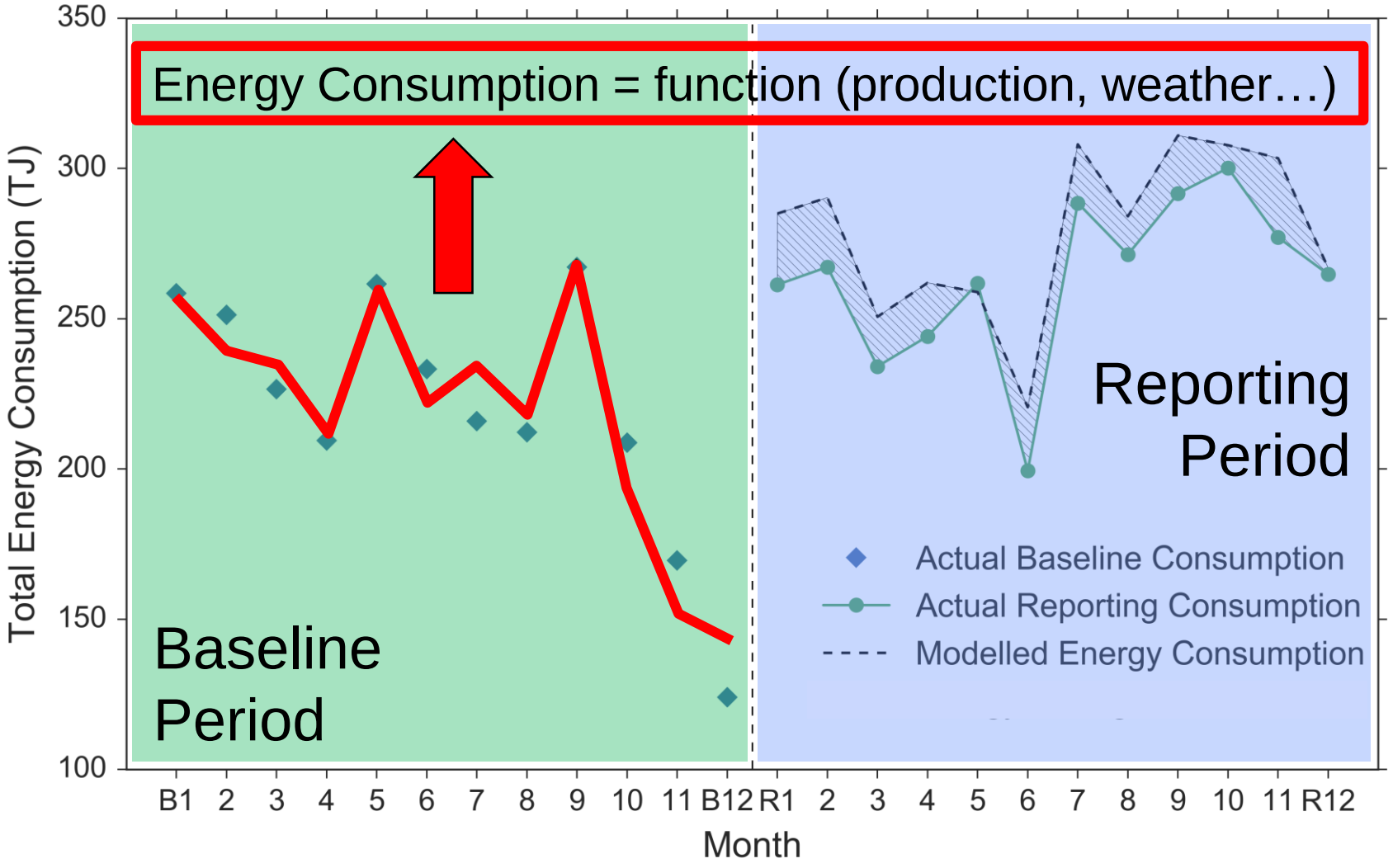
Adjustment modeling to energy consumption to make comparison of two time period comparable



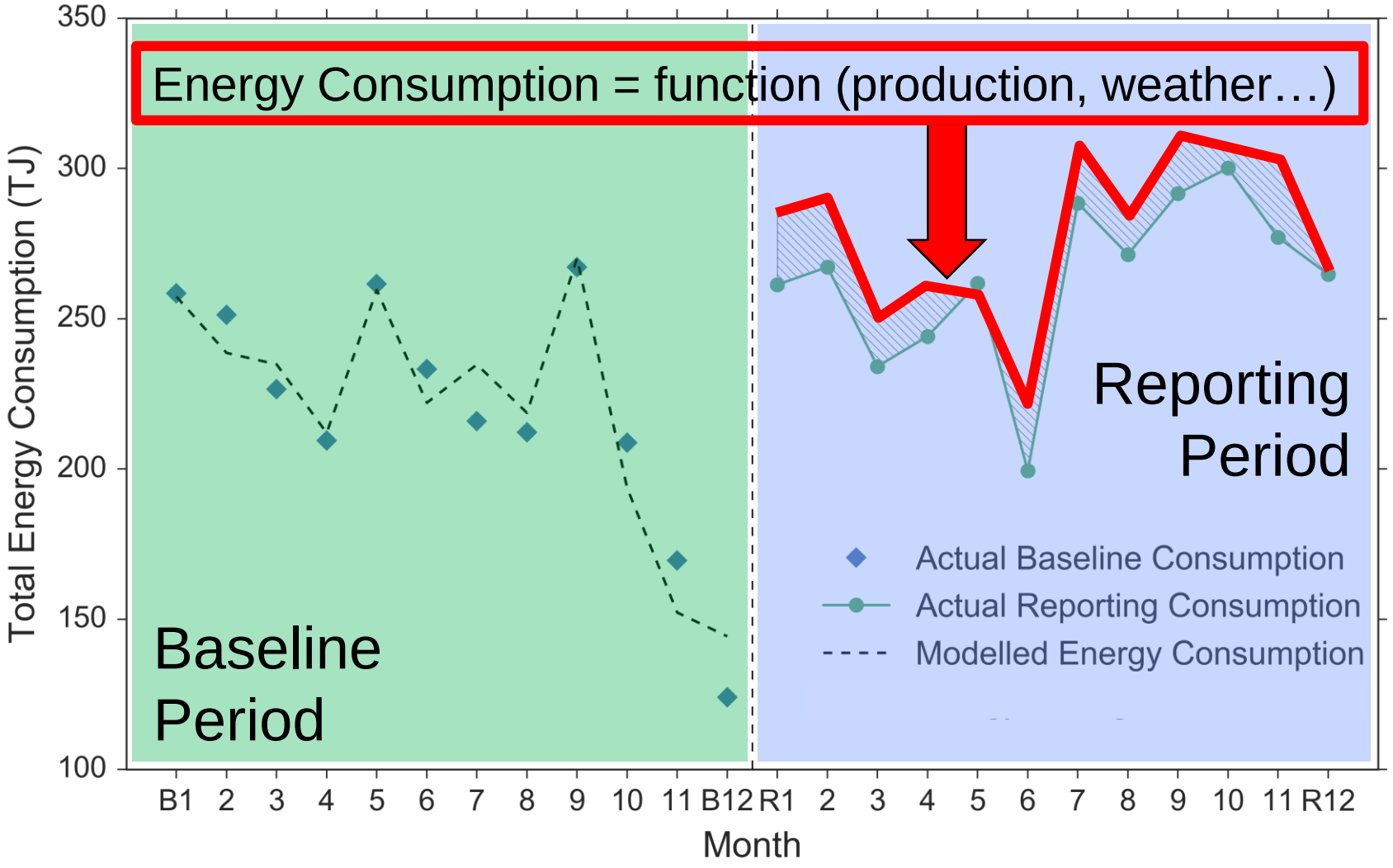
Energy consumption modeling basics



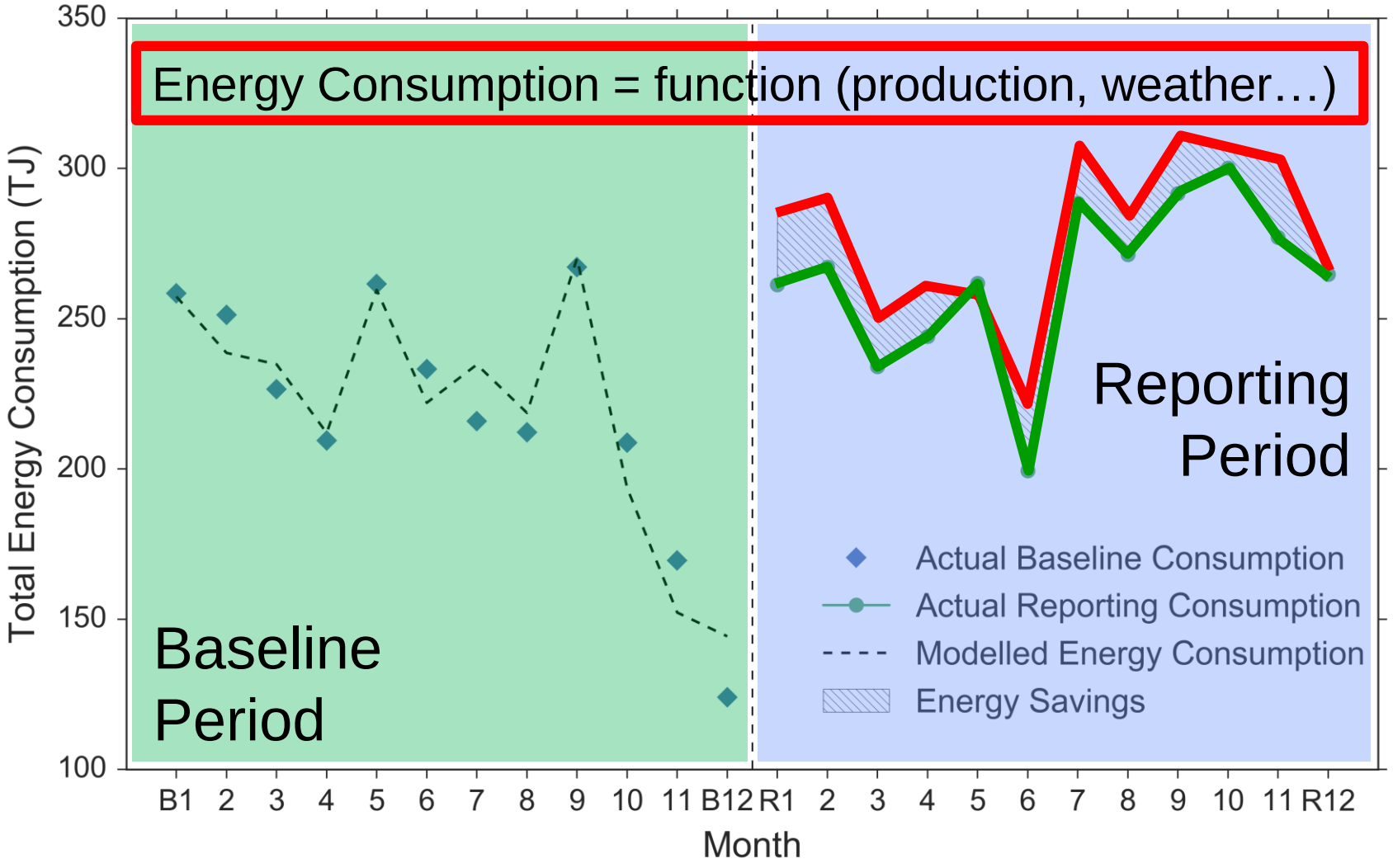
Energy consumption modeling basics



Energy consumption modeling basics



Energy consumption modeling basics



M&V protocols for SEM type programs

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Energy Trust of Oregon Production Efficiency

ENERGY INTENSITY MODELING GUIDELINE

EnergyTrust of Oregon

Revision 5.0

Energy Smart Industrial
BPA ENERGY EFFICIENCY

MT&R Guidelines

Monitoring, Targeting and Reporting (MT&R) Reference Guide

Qualified Energy Savings Measurement & Verification Protocol

EVO

EFFICIENCY VALUATION ORGANIZATION

International Performance Measurement and Verification Protocol

Superior Energy Performance
U.S. DEPARTMENT OF ENERGY

Superior Energy Performance® (SEP™)

Measurement & Verification Protocol

Standards provide harmonization to the approach for EnMS (SEM) type M&V

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International Standards for EnMS M&V

- ISO 50015 – 2014 standard on the process of conducting EnMS M&V
- ISO 50047 – 2016 standard on calculating facility-wide energy savings

US SEM M&V Harmonization

- US DOE Uniform Methods Project – SEM Evaluation Protocol
- US DOE Qualified Energy Savings Protocol – 2017 standard based upon ISO M&V and energy savings standards and experience from other US DOE EnMS programs (Superior Energy Performance)

Based upon ISO standards - key principles of facility-wide M&V

1. Facility boundaries
2. Time periods
3. Energy accounting
    1. Energy consumption data
    2. Relevant variables
4. Normalization for relevant variables – adjustment modeling
    1. Methods of normalization
    2. Development of energy consumption adjustment models
    3. Adjustment model validity requirements
        1. Quantitative requirements
        2. Qualitative requirements
5. Calculation of energy savings
    1. Common energy performance indicators
        1. Reporting period energy consumption / baseline period energy consumption
6. Bottom-up comparison
    1. Register of implemented energy performance improvement actions (registrar)
    2. Netting out other incentivized projects
    3. Conducting the bottom-up comparison
7. Reporting energy performance improvement

"50001 Ready" - a self directed US DOE SEM program designed to be adapted by utilities

US DOE is in beta test of a new self directed ISO 50001 EnMS based SEM program

- **"50001 Navigator" self direct tool for implementing an EnMS**
  - **—"Turbo Tax" for EnMS implementation**
- **M&V support**
  - **—Qualified Energy Savings protocol**
  - **—Qualified Energy Savings Tool (QEST)**
    - **Online facility boundaries based regression model energy savings calculator**
- **Utility engagement**
  - **—Developing reference program designs and supporting materials for utilities to adapt 50001 Ready tools and program as appropriate.**

Thank You!

Contact Information

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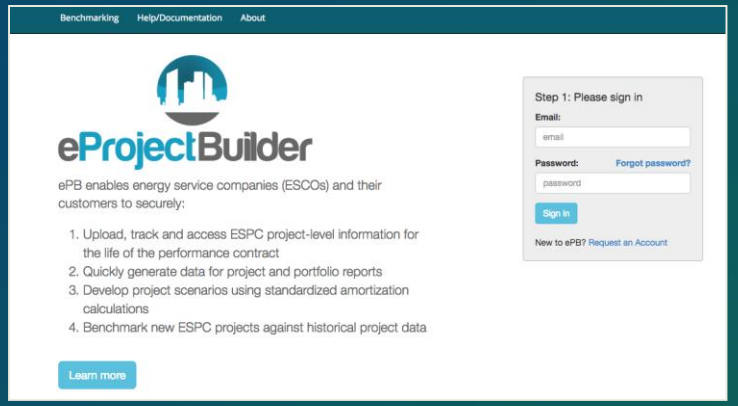
LBNL Database and Tracking Efforts for ESCO Projects

LBNL ESCO Database and eProject Builder

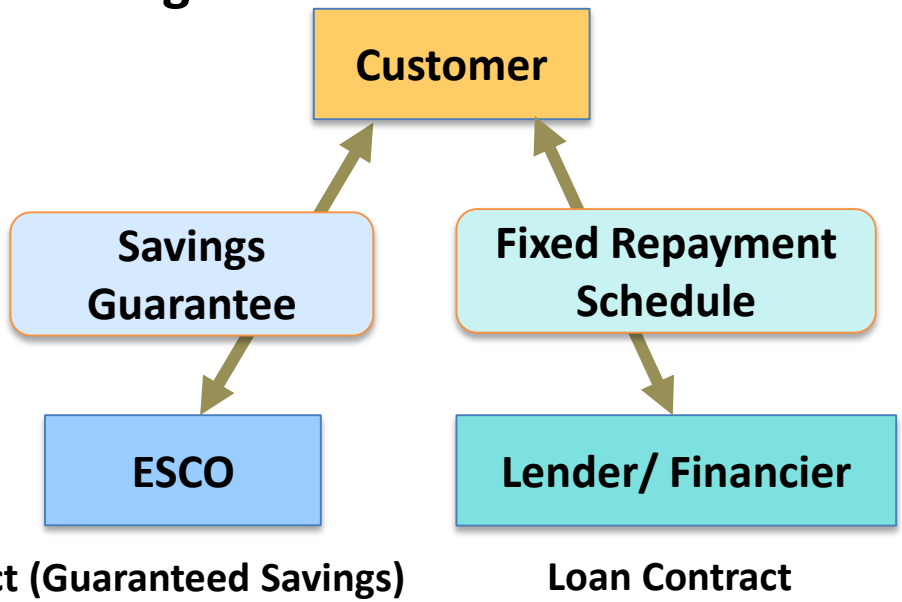


LBNL Electricity Markets and Policy Group
For U.S. DOE: FEMP and OWIP

Presentation by Elizabeth Stuart, LBNL

Background: ESCO Business Model

- **Energy Service Companies (ESCOs) in the business of improving end-use energy efficiency:**
  - Provide range of energy efficiency, engineering and construction services
  - ESCO definition: company that provides energy savings performance contracting (ESPC) as core business offering
- **ESPC provides guaranteed resource savings**
  - Customer finances the project
  - Enables EE w/little up-front capital
  - ESCO guarantees savings will be sufficient to cover customer's annual debt obligation



M&V Key for ESPC

- **Annual measurement & verification (M&V) is necessary for verifying ESPC savings & determining whether project is performing per contractual guarantee**
- **Several leading best practices for M&V have been established and continue to evolve:**
  - International Performance Measurement & Verification Protocol (IPMVP)
  - ASHRAE Guideline 14
  - DOE Uniform Methods Project
  - FEMP M&V Guidance

M&V Best Practice Guidelines

- **IPMVP – Efficiency Valuation Organization (EVO)**
  - Established in 1995; has undergone several revisions
  - Conceptual framework for measuring, calculating and reporting
  - Defines key terms and highlights issues to consider in M&V plans
  - Four M&V Options: A, B, C, D
- **ASHRAE Guideline 14**
  - Three approaches closely related to/in support of IPMVP Options B, C and D
- **DOE Uniform Methods Project (UMP)**
  - Protocols for evaluating gross savings for ratepayer-funded residential & C/I EE
- **FEMP M&V Guidance 4.0**
  - Specifies procedures for applying concepts originating in IPMVP
  - Applies to ESPC and UESC (Utility Energy Service Contracts)
  - Used by federal, state and local governments

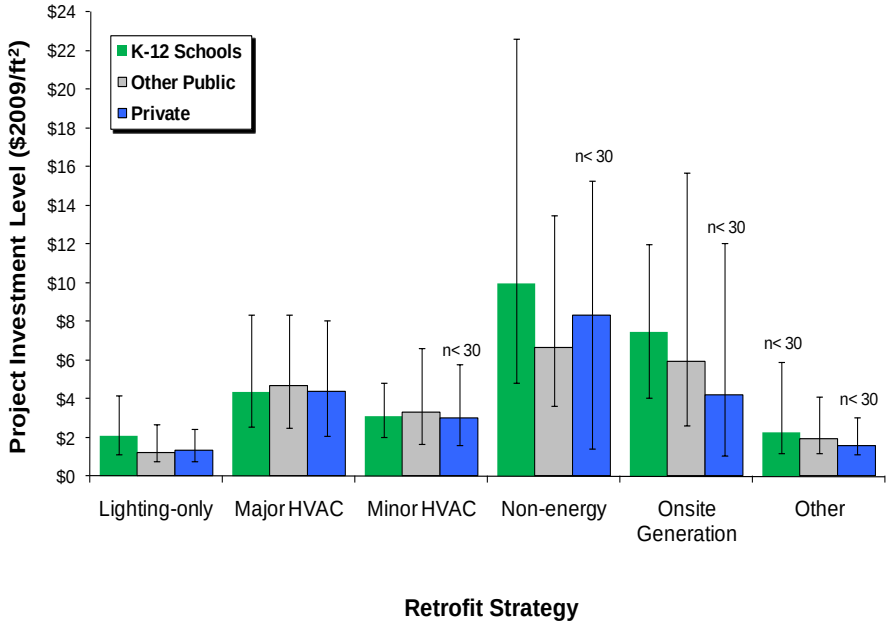
LBNL ESCO Database Project

Overview

- 15+ year NAESCO/LBNL partnership with voluntary participation from ESCO industry and government agencies
- Repository of project-level cost and verified savings data
- Largest such dataset in the world: ~5600 projects from 1990 to 2016

Project Objectives

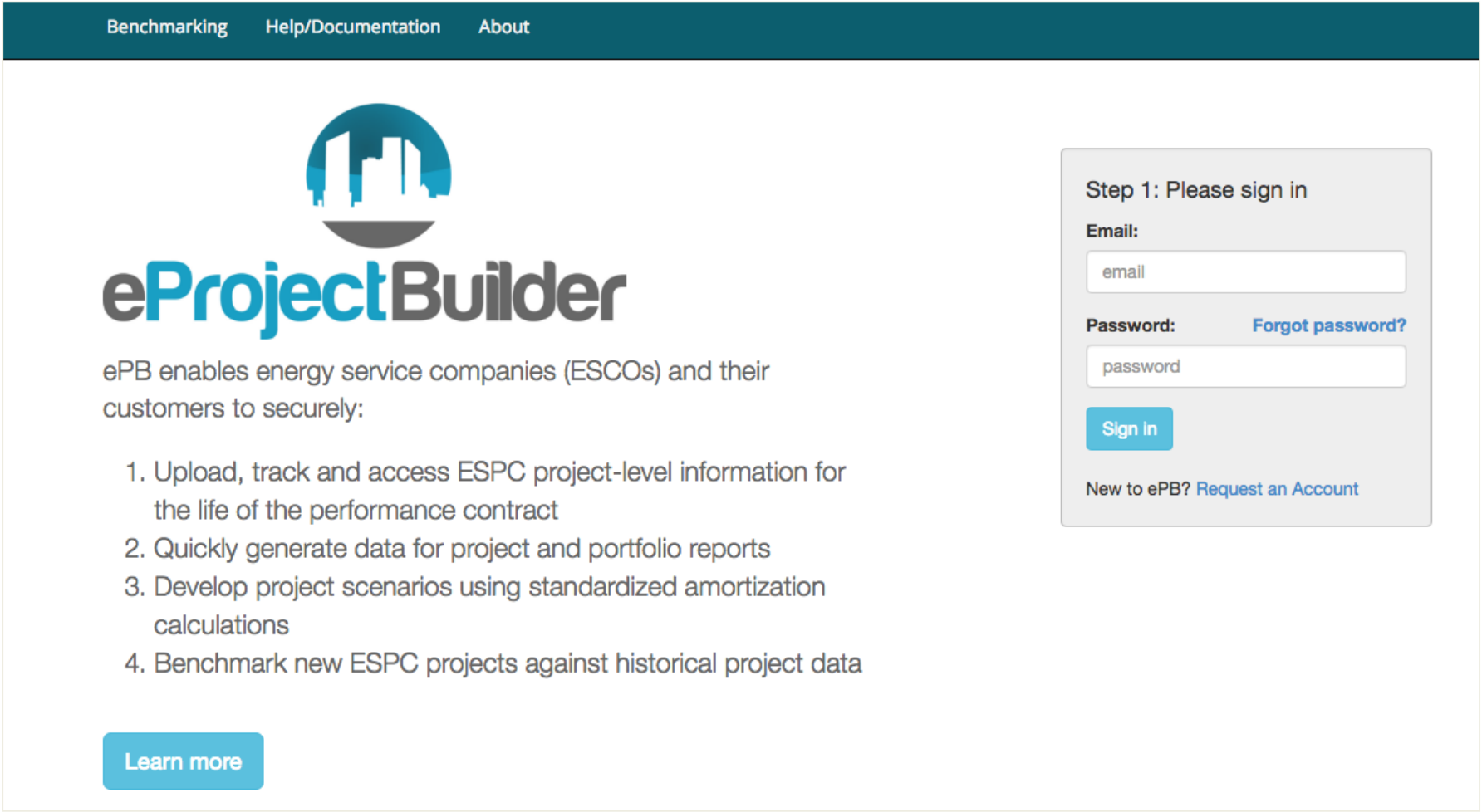
- Track ESCO industry market and project performance trends
- Objective information resource on performance contracting and private-sector ESCOs



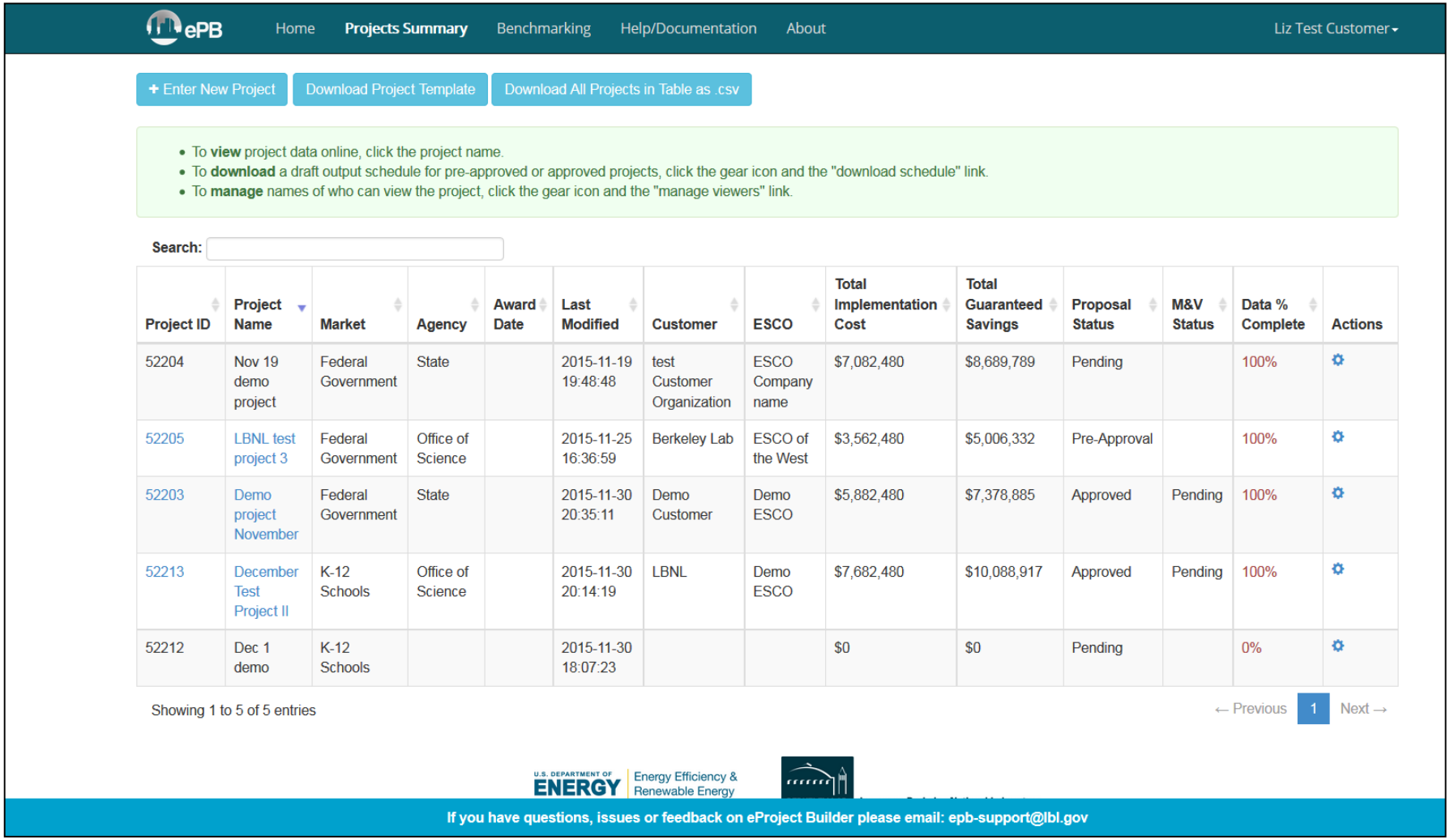
ePROJECT BUILDER ESCO PROJECT DATABASE

- **ePROJECT BUILDER (ePB) OVERVIEW**
  - Secure, web-based ESPC data entry and tracking system
  - Funded by U.S. DOE: FEMP and OWIP
  - Launched in late 2014
- **PROJECT OBJECTIVES**
  - Standardize data collected & reported across ESCOs and markets
  - Platform for tracking project and M&V for life of the project
  - Enable robust data-based analysis and benchmarking
  - Data preservation/access to agencies and ESCOs for reporting
  - Increase transparency and reduce ESPC transaction costs

eProject Builder ESCO Project Database



ePro ject Builder ESCO Project Database



ePB Home **Projects Summary** Benchmarking Help/Documentation About Liz Test Customer

+ Enter New Project | Download Project Template | Download All Projects in Table as .csv

- To **view** project data online, click the project name.
- To **download** a draft output schedule for pre-approved or approved projects, click the gear icon and the "download schedule" link.
- To **manage** names of who can view the project, click the gear icon and the "manage viewers" link.

Search:

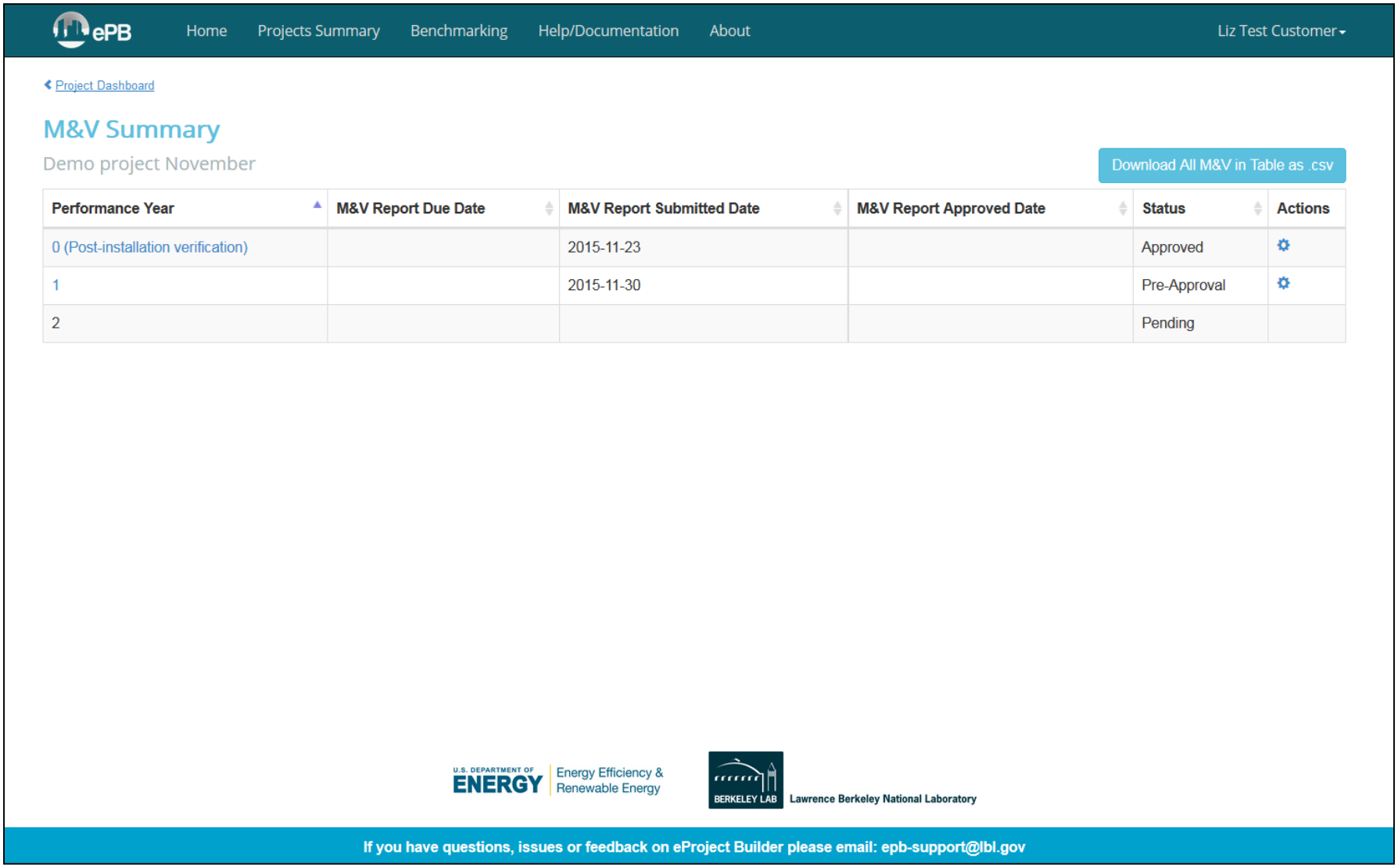
Project ID	Project Name	Market	Agency	Award Date	Last Modified	Customer	ESCO	Total Implementation Cost	Total Guaranteed Savings	Proposal Status	M&V Status	Data % Complete	Actions
52204	Nov 19 demo project	Federal Government	State		2015-11-19 19:48:48	test Customer Organization	ESCO Company name	$7,082,480	$8,689,789	Pending		100%	
52205	LBNL test project 3	Federal Government	Office of Science		2015-11-25 16:36:59	Berkeley Lab	ESCO of the West	$3,562,480	$5,006,332	Pre-Approval		100%	
52203	Demo project November	Federal Government	State		2015-11-30 20:35:11	Demo Customer	Demo ESCO	$5,882,480	$7,378,885	Approved	Pending	100%	
52213	December Test Project II	K-12 Schools	Office of Science		2015-11-30 20:14:19	LBNL	Demo ESCO	$7,682,480	$10,088,917	Approved	Pending	100%	
52212	Dec 1 demo	K-12 Schools			2015-11-30 18:07:23			$0	$0	Pending		0%	

Showing 1 to 5 of 5 entries ← Previous 1 Next →

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

If you have questions, issues or feedback on eProject Builder please email: epb-support@lbl.gov

ePro ject Builder ESCO Project Database



eProject Builder ESCO Project Database

- **Uptake/Participation**
  - Contains ~460 projects representing implementation costs of $3.8B and cumulative guaranteed savings of $9.4B
  - Incl. federal state/local, university/college, K-12, and public housing sector
- **Multiple Uses**
  - DOE FEMP requiring ePB use for ESPC; will use for DOE Qualified ESCO list submission platform
  - NAESCO to use ePB as accreditation submission platform
- **Enabling Standardized ESPC M&V Tracking**
  - 3-State Team (GA, KY, GA) evaluated ePB for improving M&V practices; found ePB suitable for agencies tracking multiple ESPC projects
  - Being considered as ESPC savings repository for National Energy Efficiency Registry (NEER)

Resource Links

- IPMVP – Efficiency Valuation Organization
  - http://evo-world.org/en/
- ASHRAE Guideline 14
  - https://www.ashrae.org/standards-research--technology/standards--guidelines/titles-purposes-and-scopes
- DOE Uniform Methods Project (UMP)
  - https://energy.gov/eere/about-us/ump-home
- FEMP M&V Guidelines Version 4.0
  - https://energy.gov/sites/prod/files/2016/01/f28/mv_guide_4_0.pdf
- LBNL ESCO Industry Research
  - https://emp.lbl.gov/projects/energy-saving-performance
- eProject Builder
  - https://eprojectbuilder.lbl.gov/

Thank you

Liz Stuart

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Discussion/Questions

Resources for more information:

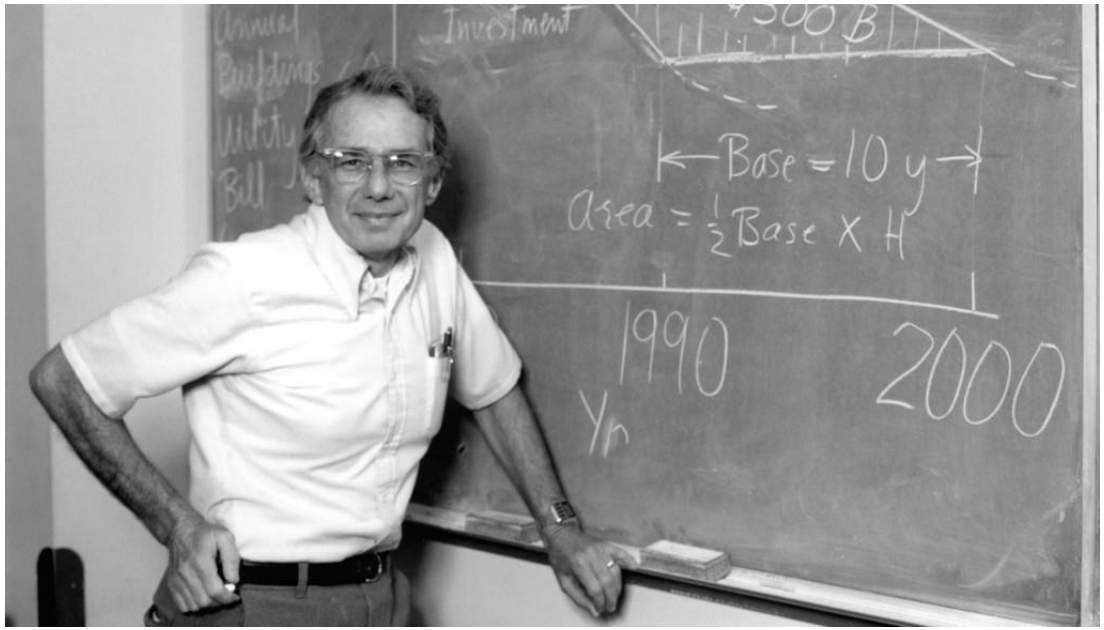
- Webinars: https://emp.lbl.gov/emv-webinar-series
- For technical assistance to state regulatory commissions, state energy offices, tribes and regional entities, and other public entities see: https://emp.lbl.gov/projects/technical-assistance-states
- Energy efficiency publications and presentations – financing, performance contracting, documenting performance, etc. see: https://emp.lbl.gov/research-areas/energy-efficiency

From Albert Einstein:

"Everything should be as simple as it is, but not simpler"

"Everything that can be counted does not necessarily count; everything that counts cannot necessarily be counted"

Art Rosenfeld (1926-2017)



Art Rosenfeld was a Berkeley Lab Distinguished Scientist Emeritus and recipient of three Presidential awards – known as California's "godfather" of energy efficiency.

Art passed away at his home in Berkeley on Friday.